

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : CENTA ANTRIEBE KIRSCHHEY
GMBH

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(72)Inventor : KIRSCHHEY GERHARD

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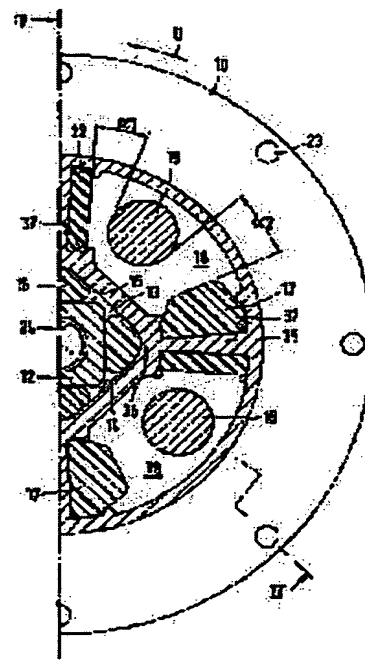
Priority country : DE

(54) SHAFT COUPLING

(57)Abstract:

PURPOSE: To increase reliability in the operation by providing a first elastic shaft coupling of a known system of a rubber roller coupling having a bar-like rubber elastic coupling body supported between a hub and an external polygon to simplify the design of a two-stage torsion rubber elastic shaft coupling.

CONSTITUTION: Four elastic coupling bodies 16 form a first group to compensate a rubber ring of a prior art in the point of the function. When the torque is introduced to a coupling flange 10 useful for a drive flange in the circumferential direction U, the coupling flange 10 is relatively displaced to a hub 12 in the rotational direction, and a rubber elastic element 16 serves as a torsion bar. In a case of a small torque equivalent to the no-load operation or a low partial load of a prime mover, the torque is transmitted to the hub 12 through the rubber elastic element 16 and to a shaft coupled therewith only from the coupling flange 10. When the torque and the vibration amplitude are increased, a rubber elastic joint element 17 of a second group reaches a force bundle to transmit the power from the coupling flange 10 to the hub 12.



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CLAIMS

[Claim(s)]

[Claim 1] With the two-step torsion elastic-axis joint for boat prime movers, especially ***** and the coupling flange which should be substantially prepared in a driving side, The hub which is inserted in in the central crevice of a coupling flange in the direction of an axis and which should be established in a passive-movement side, The 1st group which it consisted of a secondary power transfer element combined with the hub by torsion-proof nature, and this element is equipped with the pawl and the elastic-coupling element of two groups which advance into axis parallel in the longitudinal crevice which extended in the hoop direction of a coupling flange, and has at least one elastic component between a coupling flange and a hub It is prepared, the 2nd group is assigned to the longitudinal crevice of a coupling flange, and this crevice is received. The pawl is assigned to peripheral surface migration **** in the hoop direction, and rather than the 2nd group, the elastic-coupling object of the 1st group twists much more, and is adjusted to elasticity. At the time of low torque Or until power is chiefly transmitted to a hub through the elastic-coupling object of the 1st group from a coupling flange at the time of no-load running, or the time of a low partial load and a partial load results in large intermediary ***** and the full load of high torque In that by which the elastic-coupling object of the 2nd group adjusted to torsional rigidity is automatically wedged into power transfer the 1st elastic-coupling stage It consists of methods of the well-known rubber roller joint which has the cylindrical rubber flexible coupling object by which bearing was carried out between the hub and the external polygon. Further a coupling flange It is the two-step torsion elastic-axis joint characterize by for the amount of [center on the longitudinal crevice for insert in a pawl] ** or intermediary limit wall form the multi-section polygon in coincidence , and establish the elastic-coupling object of both groups by this alignment mutually , without shift in the direction of an axis substantially .

[Claim 2] The central crevice (13) of a coupling flange (10) and a hub (12) have one polygon profile, respectively, and, as for a hub (12) and a coupling flange crevice (10), those profiles shift a peripheral surface for them. It is the joint according to claim 1 characterized by inserting the elastic-coupling object (16) of the 1st group in response to radial initial stress preferably into the free space which was inserted in and was therefore formed between the hub (12) and the coupling flange crevice (13) at the gap of a peripheral surface.

[Claim 3] The joint of one publication of claim 1 or consecutiveness characterized by therefore limiting the profile of a hub (12) and a coupling flange crevice (13) to the forward square.

[Claim 4] On the other hand, a coupling flange crevice (10), A longitudinal crevice (18) is each in another side. - As opposed to a part for the wall from which it is therefore limited or restricted to a part for comparatively thin - wall (35), and the corner (36) of one polygon separates two longitudinal crevices (18) of a coupling flange (10), respectively (35) The joint of one publication of claim 1 or consecutiveness characterized by being prepared in radial together with a single tier.

[Claim 5] The joint of one publication of claim 1 or consecutiveness characterized by constituting substantially the secondary power transfer element (20) which has the pawl (19) which advances into the longitudinal crevice (18) of a coupling flange (10) as an even disk, and direct coupling being carried out to the hub (12) at torsion-proof nature.

[Claim 6] The joint according to claim 5 characterized by for a secondary power transfer element (20) having the central acceptance crevice (21) which has the polygon profile of a hub (12)

substantially, and therefore being combined with the hub (12) by caulking or the riveting.

[Claim 7] The joint of one publication of claim 1 or consecutiveness characterized by constituting the elastic-coupling object (17) of the 2nd group as a sleeve, and inserting this sleeve in the pawl (19) of the secondary power transfer element (20) combined with the hub (12), and cooperating with the end lap of a longitudinal crevice (18).

[Claim 8] The joint according to claim 1 with which the elastic body (17; 22) of the 2nd group is constituted as pad-like mold goods, and is characterized by being inserted in the pocket-like acceptance section (37) and being held in the range of both the end laps of a longitudinal crevice (18).

[Claim 9] The joint according to claim 8 with which a pawl (19) is characterized by the thing between elastic components (17 17; 17 22) for which a static position is mostly occupied in the center, respectively when a joint is non-loaded condition.

[Claim 10] The joint according to claim 1 which the joint object (17) of the 2nd group which turned to the drive hand of cut (U) is constituted as pad-like mold goods, and is characterized by being constituted only as a stop object with the elastic-coupling object (22) substantially even to tabular [which has the longwise rectangular section] which turned to reverse with the drive hand of cut (U).

[Claim 11] The joint according to claim 8 or 9 characterized by for a pawl (19) shifting from the hand of cut (U) of a coupling flange (10) to the direction of the end lap of a longitudinal crevice (18) which turned to reverse, or the direction of an elastic-coupling object (17), and occupying a static position when a joint is non-loaded condition.

[Claim 12] The hub (12) is divided into the original hub shell (12') which should be firmly combined with a shaft (11), and the sleeve (12'') as a component of the 1st elastic-coupling stage. A hub shell (12') with a sleeve (12'') The joint of one publication of claim 1 or consecutiveness characterized by forming the fit of a sliding-fit method in which slipping is possible in the direction of an axis of torsion-proof nature.

[Claim 13] The joint according to claim 12 characterized by a sleeve (12'') consisting of plastics, such as a polyamide, especially.

[Claim 14] The joint of one publication of claim 1 or consecutiveness to which a secondary power transfer element (20) considers being designed by the fault dimension exceeding necessary reinforcement as the description in order to form the gyrating mass which has higher mass moment of inertia.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the two-step torsion elastic-axis joint indicated by the premise part of claim 1.

[0002]

[Description of the Prior Art] Such a shaft coupling is well-known by the public-relations publication of an American mel cruiser (MerCruiser) company. especially this shaft coupling was designed in order to reduce the noise (the so-called "gear hammering -- ") generated at the time of no-load running of a prime mover, or the time of a low partial load. especially such [such noise] load conditions -- ** -- when the intermediary joint is not designed by sufficient torsion elasticity, it generates. In the two-step mel cruiser shaft coupling, the coupling flange is combined with the hub through the elastic rubber ring object comparatively adjusted to torsion elasticity. That is, the torque transmitted to a coupling flange from the flywheel of a boat prime mover is transmitted to a hub through this rubber elasticity ring, and the transmission shaft is combined with this hub by torsion-proof nature. Only the rubber ring is first wedged in flux as an elastic-coupling element at the time of no-load running, and the low time of an engine rotational frequency.

[0003] Furthermore, the hub is firmly combined with the pan element or disc-like secondary power transfer element prepared in one side of joint arrangement. The rubber elasticity sleeve which this power transfer element was supporting six pins prolonged in the direction of an axis, and was inserted in this pin is torsional rigidity from the rubber elasticity ring element mentioned first. The pin with a sleeve is inserted in in the longitudinal crevice which extended exceeding each subrange of a peripheral surface inside the coupling flange. By the limitation to which driving torque stops at no-load-running within the limits or a low partial load, the pin with an elastic sleeve can be freely oscillated in this longitudinal crevice, without colliding with the boundary of a longitudinal crevice. If driving torque increases and a gap of the peripheral surface between joint partial becomes large, the bigger relative motion in a hoop direction will appear also between the bolts and the longitudinal crevices of a coupling flange which rubber elasticity ring independent stability is between a coupling flange and a hub rather than are enough any longer, therefore were equipped with the rubber elasticity sleeve. Based on a bigger include-angle stroke, now, a rubber elasticity sleeve reaches the boundary suitable for the hand of cut of a coupling flange of a longitudinal crevice, and achieves the force or a torque communicative function.

[0004] The attenuation characteristic curve which such a two-step torsion elastic coupling shows is going up gently, when only the elastic-coupling object which consists of a ring acts at the time of no-load running, and the time of the partial load range, the elastic-coupling object of the 2nd group adjusted to torsional rigidity is thrown in, or this curve shifts to the offset which goes up graduated.

[0005] The direction of radical Motohara ** of a two-step design to this well-known joint is suitable by preparing the 1st attenuation stage of torsion elasticity to attain the purpose which lowers considerably the noise generated at the time of no-load running or partial load operation. The fault of a well-known joint has complicated structure, and it is in the point which is expenditure quantity truly. That is, clearly, by one side, a rubber ring is ****ed with a hub and the stop is carried out on the other hand to the coupling flange. On the other hand, an elastic ring object is ****ed with a joint part, it ****s, and must have the stop flange and the ring must be fabricated by this flange so that a

stop can be carried out. Manufacture and assembly serve as expenditure quantity, and serve as cost quantity from this again according to it.

[0006]

[Problem(s) to be Solved by the Invention] Then, the technical problem of this invention is simplifying considerably the two-step torsion elastic-axis joint of a premised class on a design in the premise part of claim 1. Furthermore, weight is put on raising operational reliability.

[0007]

[Means for Solving the Problem] therefore, this invention solves this technical problem with the description specified by the description part of claim 1 substantially in the first place [measure].

[0008] In this way, a joint with the whole simple structure is obtained and it is this joint. - Since it does even when he has no vulcanized elastic-coupling object, - operational reliability is also very high. To be sure, the rubber roller joint itself is well-known. However, this invention uses this joint by the therefore especially suitable method to unify this in the 2nd joint stage by the optimal method. This unification is related to radial allocation of both stages, and the direction allocation of an axis. That is, in the advanced technology described first, to having to prepare a rubber ring before a coupling flange in the direction of an axis partially at least, now, not both stages have a gap of the direction of an axis, but they can unify it as the stage which is one side rather is covered in the stage of another side. The joint unit which consists of this very narrowly in the direction of an axis by the advantageous method is also offered.

[0009] In the torsion elastic-axis joint by this invention, chiefly, rubber components and metal components contact and metal components do not almost contact mutually. In this way, the fretting corrosion ****(ed) among the metal components which carry out phase contact when the force changes is prevented. This joint is extremely excellent in abrasion resistance, and maintenance-free.

[0010] Therefore, the profile of a hub and a coupling flange crevice is preferably limited to the forward square. On the other hand, a longitudinal crevice is each in a coupling flange crevice and another side. - Therefore, it is limited or restricted to a part for comparatively thin - wall, and when the corner of one polygon is established in radial together with the single tier to a part for the wall which separates two longitudinal crevices of a coupling flange, respectively, one suitable configuration is obtained especially. thereby -- a joint -- especially the lightweight skeletal structure of a coupling flange is consistently attained by the wall thickness which can be designed to about 1 law, and, as for especially the coupling flange with a complicated configuration, thereby, it is desirable a metal or plastics, and to especially be manufactured as a casting article from fiberglass reinforced plastics.

[0011] The configuration of the advantageous description of others for this invention and desirable others is specified by the remaining subordination claim, is due to the accompanying drawing and becomes clear from the following explanation about the example of shoes.

[0012]

[Example] Joints are the coupling flange 10 assigned to the driving side and a passive-movement side first, respectively, and a metaphor includes the hub which should be combined with the shaft 11 of a gear. A coupling flange 10 has the central crevice 13 which has the polygon profile 14. A hub 12 has the suitable polygon profile 15 similarly, its neighboring die length is short, therefore its diameter is small.

[0013] In the case of the square with which the hub 12 and the coupling flange crevice 13 were moreover illustrated by it between the profile 15 and the inner profile 14 of the coupling flange crevice 13, cylindrical or the cylindrical rubber elasticity object 16 is inserted outside the hub 12 into the free space produced when only 45 degrees shifts a peripheral surface to accuracy mutually and it is prepared in it. The rubber elasticity object 13 is attached in the coupling flange crevice 13 in front of the external surface 15 of a hub 12 in response to remarkable radial initial stress. This anchoring is performed by the works side using special equipment. Then, this configuration cannot be decomposed at the time of actual operation.

[0014] In the case of this example, four elastic-coupling objects 16 form the 1st group, and the rubber ring of the advanced technology described first is compensated in respect of a function. If torque is introduced in a hoop direction U to the coupling flange 10 which serves as a drive flange, a coupling flange 10 will be relatively displaced to a hub 12 in this hand of cut, and the rubber

elasticity element 16 will commit it as a torsion bar spring in that case. this condition shows drawing 2 -- having -- **** -- this drawing -- illustration -- since it is simple, not a gap but that reverse rotation of the peripheral surface of the coupling flange to a hub are illustrated. In the case of the small torque equivalent to no-load running or the low partial load of a prime mover, transfer of torque is carried out to a hub 12 and the shaft 11 combined with this through the rubber elasticity element 16 only from a coupling flange 10. In this way, this 1st joint stage that has the torsion elasticity rubber element 16 can decrease torsional oscillation independently until it results in fixed extent.

[0015] If torque and an amplitude become large, the rubber flexible coupling element 17 of the 2nd group will reach in flux. This crevice is the form where this rubber elasticity object 17 is attached in the end which the peripheral surface hand of cut U of the peripheral surface crevice 18 has in a reverse side, respectively, and encloses this on the outside of a central coupling flange crevice, and is prepared at the coupling flange. The end is being firmly fixed to the disc-like secondary power transfer element 20, a pawl 19 is inserted in in the peripheral surface crevice 18 in the direction of an axis, and power transfer is performed from a coupling flange 10 to a hub 12 through said rubber flexible coupling object 17 which decreases **** of this pawl. The secondary power transfer element 20 is too combined with the hub 12 by torsion-proof (for example, refer to drawing 4). Therefore, association with this element and a hub 12 is also performed also for association with a pawl 19 and the power transfer element 20 at a configuration joint type, respectively to caulk [a riveting or]. This also becomes clear also from drawing 4 to drawing 6 and drawing 8 . Since it has the peripheral surface in which a hub 12 differs from a circle, it is not necessary to take a special configuration joint measure here. It is enough if the suitable polygon opening 21 is formed in the power transfer element 20.

[0016] When a coupling flange 10 and a hub 12 are the time of no-load running, or the lower part load range, as long as it oscillates mutually in a hoop direction, as stated on -, only the rubber elasticity element 16 of the - 1st group performs a periodic-damping operation. However, if a rotational frequency and torque go up and this oscillation reaches the big amplitude, although a gap of the joint part 10 and the peripheral surface between 12 increases, the 2nd group can also be wedged in flux by ***** 19 moving in the direction of the rubber elasticity element 17 of the 2nd group, now, torque can be twisted, and it can transmit to a driving shaft elastically. This condition is shown in drawing 2 .

[0017] In order [which can do torsional resilience capacity of the 1st joint stage] to excel and to enable it to fully use, the free space $\alpha 2$ measured in the hoop direction, i.e., a free path until a pawl 19 can **** to the elastic-coupling element 17 of the 2nd attached group, is larger than the posterior part free space concerned made into the peripheral surface include angle $\alpha 1$. Substantially, since it is the duty to prevent metallic contact and to decrease **** of a pawl 19 when negative torque appears, the India rubber element 22 even to tabular which can be accepted in a posterior part has fundamentally function that the pad-like rubber elasticity object 17 is another. Especially negative torque may appear at the time of the resonance passage at the time of transient operation.

[0018] The explained two-step torsion elastic-axis joint can be attached by the works side, without having simple structure, preventing the fretting corrosion which has appeared [***** and also] in metal pair metallic contact and it, and using a bolt fixed means so that clearly. The elastic-coupling objects 17 and 22 are simply inserted in the acceptance pocket 37 in the direction of an axis, and, therefore, are held in it at friction association and configuration association.

[0019] This joint is excellent in torsional resilience behavior. The 1st step which interposed the elastic-coupling object 16 is high torsional resilience which has few graduated characteristic curves. The 2nd step is most suitable for transmitting until it has strong progressiveness and results [from the range between in this way more high partial loads] in a full load. This design is substantially made on the basis of the rating torque of a joint as [participate / the 1st step participates and / about 10% / about 90% / in power transfer and attenuation / the 2nd step].

[0020] Substantially, operation of drawing 3 is the point that a pawl 19 is not a cylinder bolt but the comparatively even stud which has the rectangular section mostly in this case, and is different from the operation as which it was explained based on drawing 1 and drawing 2 . In the joint of drawing

1 , attenuation will begin from that as functional difference more softly than the case of the joint of drawing 3 with which contact on a pawl 19 and the rubber elasticity object 17 is performed mostly on the whole surface. Furthermore, also in a hand of cut U, the include-angle stroke in that hard flow is the same until it comes to **** on the elastic-coupling object 17 which the configuration is made so that a pawl 19 may be located in the longitudinal crevice 18 in the center of a peripheral surface, and was identically constituted in this case, when a joint is a non-load static position. Thus, especially the completely symmetrical joint fits the application in which a hand of cut carries out alternation.

[0021] The rubber flexible coupling object 17 of the 2nd group is not directly assigned to the longitudinal crevice 18, and is assigned to the pawl 19, and it consists of the 3rd embodiment shown in drawing 5 and drawing 6 as a sleeve object pushed against it. The reserve orientation in a hoop direction is made by the method of contrasting with drawing 1 in this case. See the peripheral surface include-angle ratios α_2/α_1 . The advantage of this embodiment is in the thing with the almost simple configuration of the longitudinal crevice 18 of a kidney form simply limited on the configuration of an elastic body 17, and another side by one side.

[0022] The drive collection equipment concerned can be equipped with the joint of the form described above in the direction of an axis. While being combined with the peripheral surface hole 23 by machine part, such as a flywheel, through **** which is not illustrated, the coupling flange 10 is constituted considering the inside as an involute-spline cross section 24, in order that a hub 12 may fit in in the direction of an axis to the shaft 11 formed suitably.

[0023] To it, it is illustrated by drawing 7 and drawing 8 , and the direction push-in nature of an axis of a joint is realized using the elastic interlocking joint 25 which contains the sleeve 29 by which the stop was ****ed and carried out to the flange 28 of a flywheel by the rubber cylinder 26 and **** 27, respectively in the embodiment of the design which was in agreement with the example of drawing 1 and drawing 4 in respect of others. The rubber cylinder 26 is useful to having a tolerance compensation function, preventing metal pair metallic contact substantially, and it being inserted in the coupling flange hole 30, and receiving directly.

[0024] The acceptance hole 31 of a hub 12 is constituted by the cone form in this case, and the end of a shaft 12 has a taper 32 according to it. In this case, a wedge 33 and the transverse-plane **** stop section 34 are useful to association and immobilization. The advantage of this configuration can perform immobilization of the hub 12 to a shaft 11 quickly easily, and is to be able to make it reliable enough.

[0025] The joint shown in drawing 9 - drawing 11 is divided into original hub-shell 12' and sleeve 12" which the hub 12 should combine with a shaft 11. This sleeve 12" is the component of the 1st joint stage, and the rubber flexible coupling object 16 is attached in it. Sleeve 12" and hub 12' have agreed mutually so that it may insert in torsion-proof nature and can combine with it mutually by eye a sliding fit. Hub-shell 12' and sleeve 12" are equipped with transverse-plane color 12'a and 12"a, respectively for the **** limit. In process of the direction push-in association of an axis, assembly is performed to reference as follows in drawing 11 in this case. That is, the secondary power transfer element 20 which has a pawl 19 is being fixed to hub-shell 12', the blocking and wedging of this hub shell are first carried out to the end of a transmission shaft 11, and the remaining joint configuration (left half of drawing 11) is attached in an engine side by ****ing and carrying out the stop of the coupling flange 10 to an engine flywheel. Next, a gear is pushed aside by hub-shell 12' in sleeve 12" to engines in the direction of an axis again in that case.

[0026] The "polygon profile "strict [at the limitation mentioned / this], for example" rectangle" is not meant exclusively. For example, molding of a class as shown in the peripheral face of a hub 12 by drawing 12 again at the inner skin of the coupling flange crevice 13 is also a polygon configuration in the semantics of this invention. although it is deformable between a hub 12 and a coupling flange crevice -- however, "*****" -- it is important that the rubber elasticity object 16 is held in the location which cannot do things. So, as for a rubber elasticity object, it is desirable for it to be positioned at corner within the limits of a coupling flange crevice, and to be contacted to the field 15 by the side of a hub. This field 15 does not need to be even at all. Corresponding to illustration of drawing 12 , intermediary concave surface formation of it can also be carried out in Mukai at the rubber elasticity object 16. From that, an incidentally more steep spring characteristic

curve (improvement in progressiveness of elastic attenuation) is concluded. By drawing 12 , when the rubber flexible coupling object 16 is a static position, having only received very slight radial initial stress is shown. That is, in this case, a damping property is torsion elasticity, next turns into torsional rigidity rapidly at first.

[0027] Finally, the tabular secondary power transfer element is intentionally designed by the fault dimension, and points out having the big diameter beyond the need especially. As a result of secondary mass moment of inertia's increasing in this way, resonance of a joint system can be shifted in the direction of a lower rotational frequency.

[0028] That it must finally emphasize in addition is the point that the wall which the coupling flange 10 consists of any operations in the shape of a frame, and limited crevices 13 and 18 and it, or adjoined mutually is established appropriately, and is assigned. Therefore, this is attained by that a number of peripheral surface crevices 18 which were in agreement with the number of the polygon side faces of a hub 12 and the coupling flange crevice 13 are formed substantially, and the bridge wall 35 which divides the peripheral surface crevice 18 is established together with one train to the polygonal corner 36 by radial. Thereby, all ingredient cross sections can be designed with the dimension same in approximation as a desirable thing.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a radial half section Fig. in the unloaded condition of the shaft coupling twisted like the 1st operative condition.

[Drawing 2] It is the illustration of the same joint by which the load was carried out with torque.

[Drawing 3] The embodiment slightly changed compared with operation of drawing 1 and drawing 2 is shown.

[Drawing 4] It is a radial sectional view equivalent to the IV-IV cross section of drawing 1 - drawing 3.

[Drawing 5] It is the cross-sectional view of alternative joint structure.

[Drawing 6] It is drawing of longitudinal section of alternative joint structure.

[Drawing 7] It is the cross-sectional view of another configuration.

[Drawing 8] It is drawing of longitudinal section of another configuration.

[Drawing 9] It is the half-cross-sectional view of the arrangement which has the hub divided into two.

[Drawing 10] It is drawing of longitudinal section of drawing 9.

[Drawing 11] It is a sectional view equivalent to drawing 9 in a decomposition condition.

[Drawing 12] The form status change kind about the polygon configuration of a hub and a coupling flange crevice is shown.

[Description of Notations]

10 Coupling Flange

11 Shaft

12 Hub

12' Hub shell

12" Sleeve

13 Coupling Flange Crevice

14 Inner Profile

15 Polygon Profile

16 Elastic-Coupling Object

17 Rubber Flexible Coupling Element

18 Peripheral Surface Crevice

19 Pawl

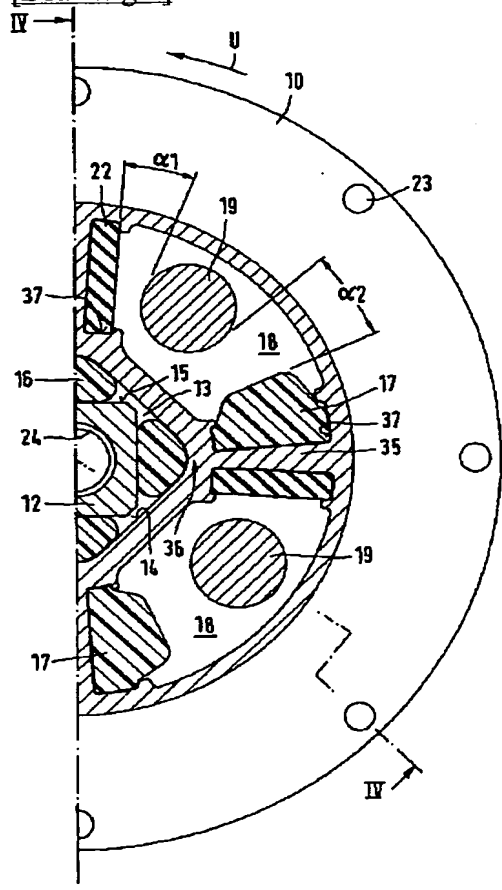
20 Secondary Power Transfer Element

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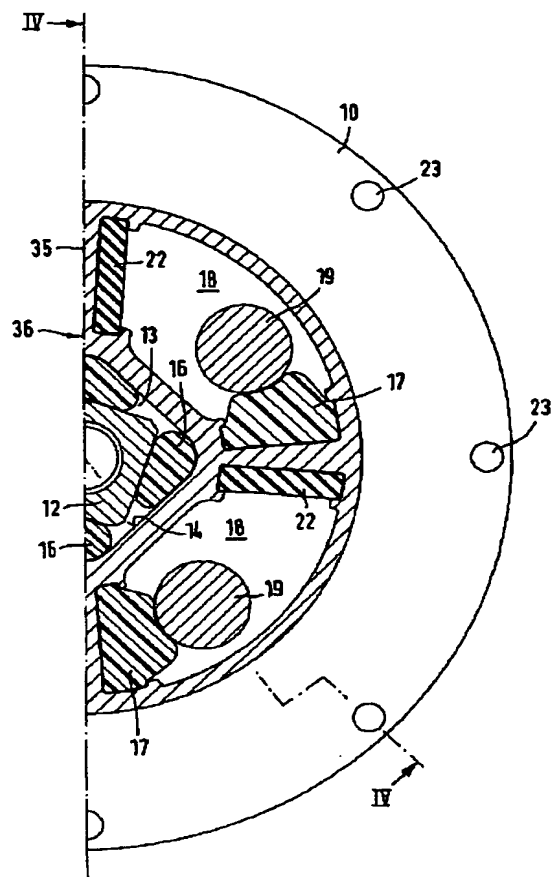
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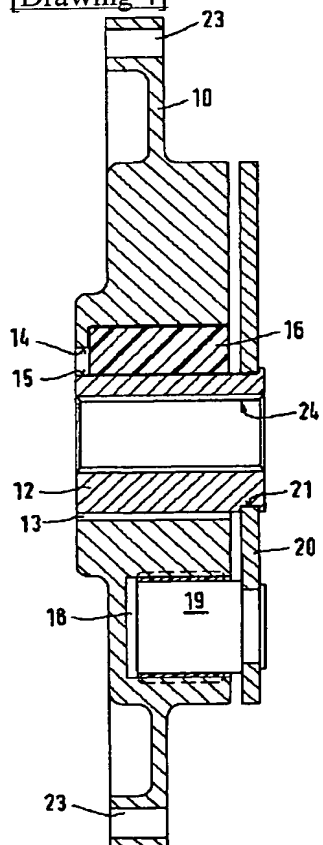
[Drawing 1]



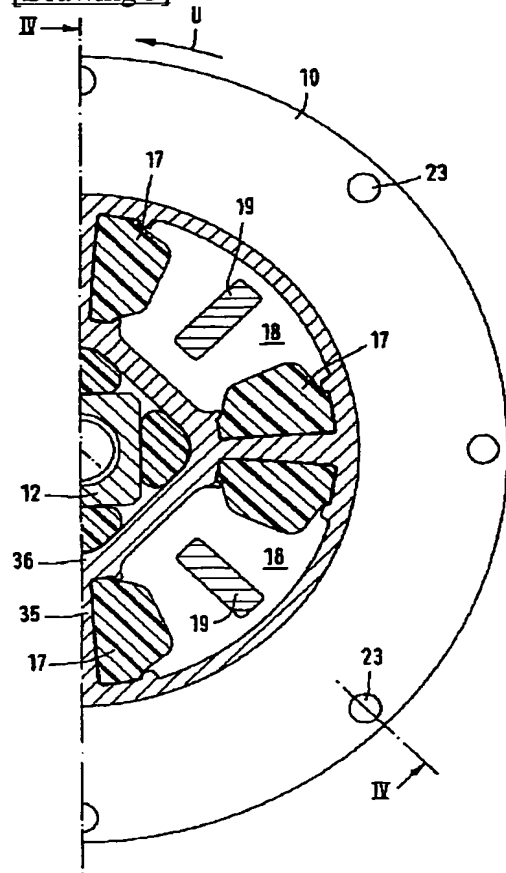
[Drawing 2]



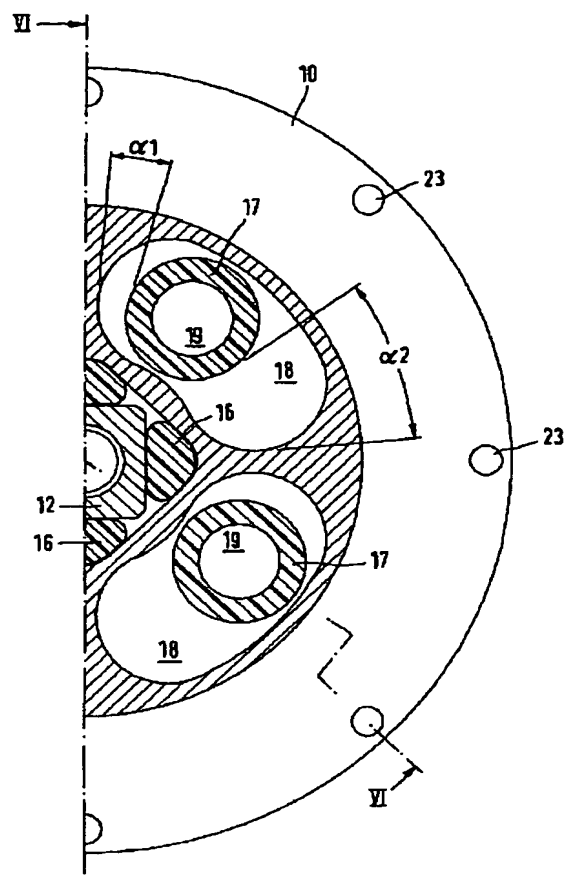
[Drawing 4]



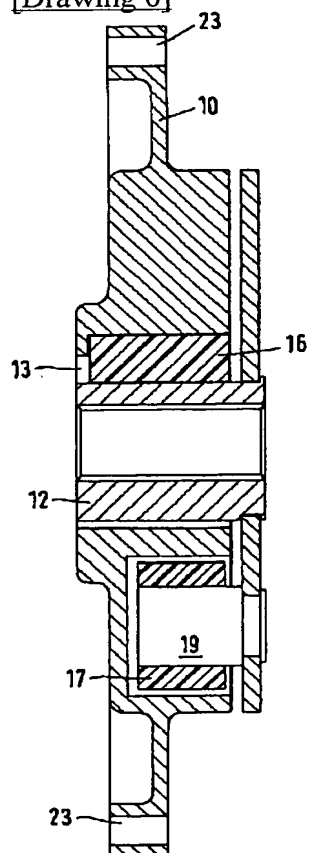
[Drawing 3]



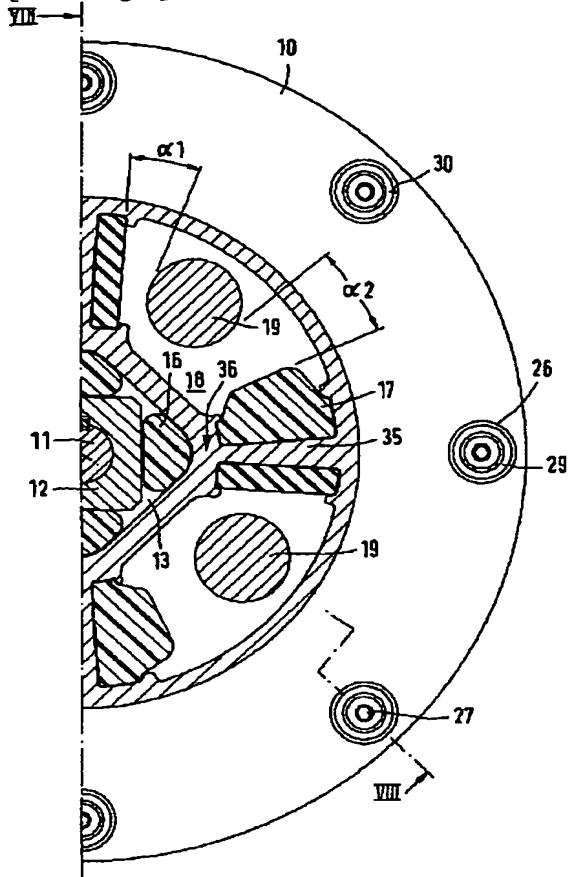
[Drawing 5]



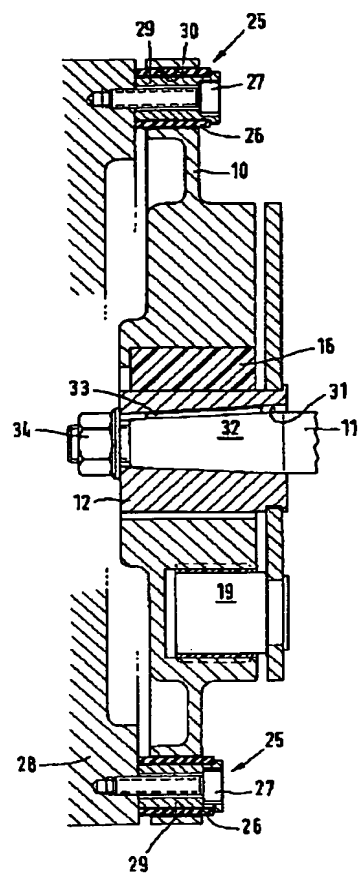
[Drawing 6]



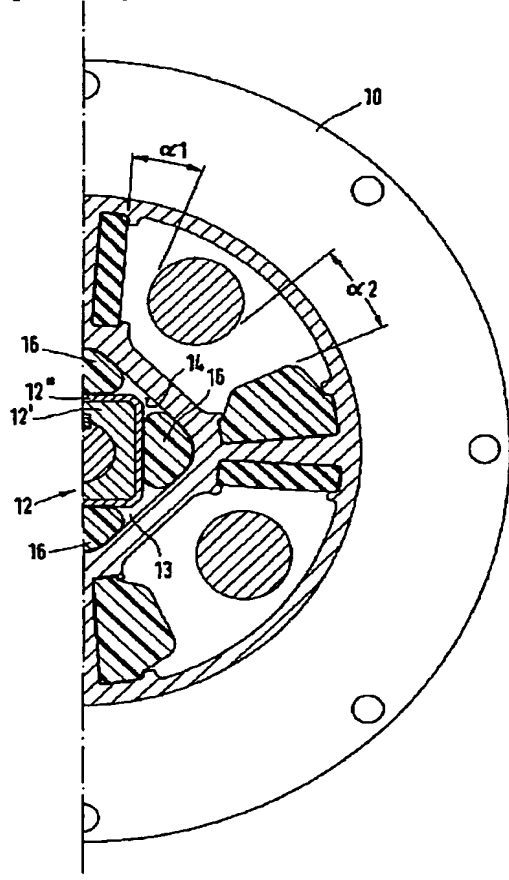
[Drawing 7]



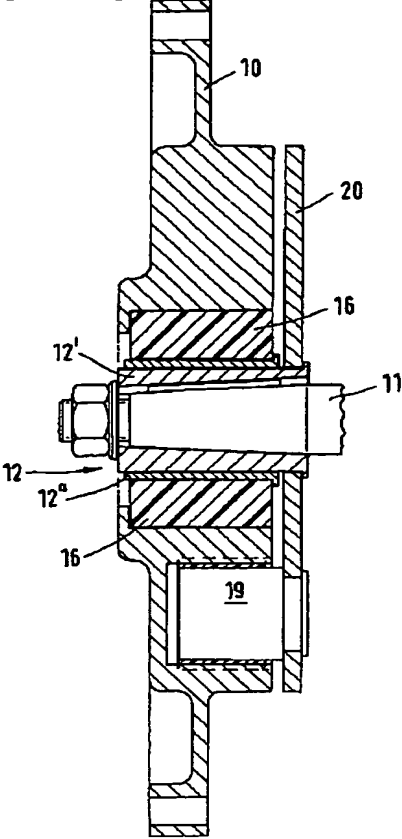
[Drawing 8]



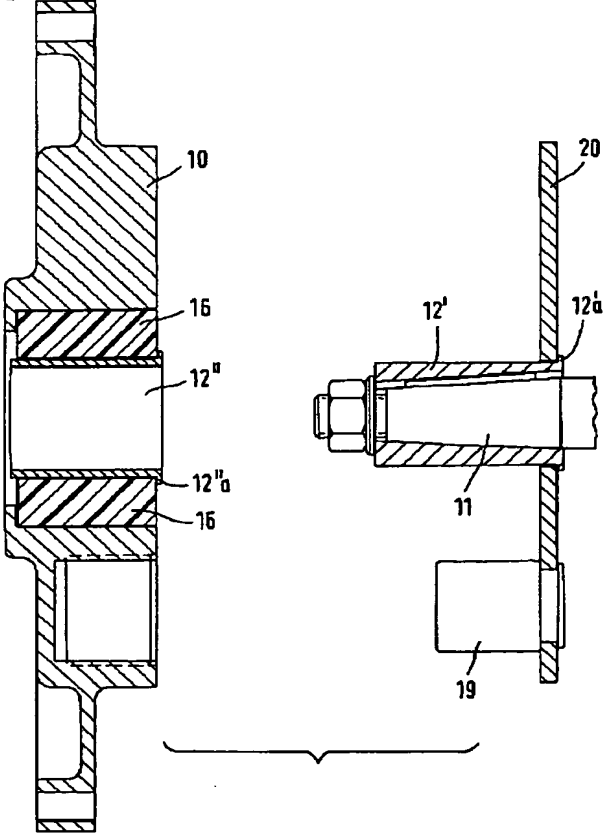
[Drawing 9]



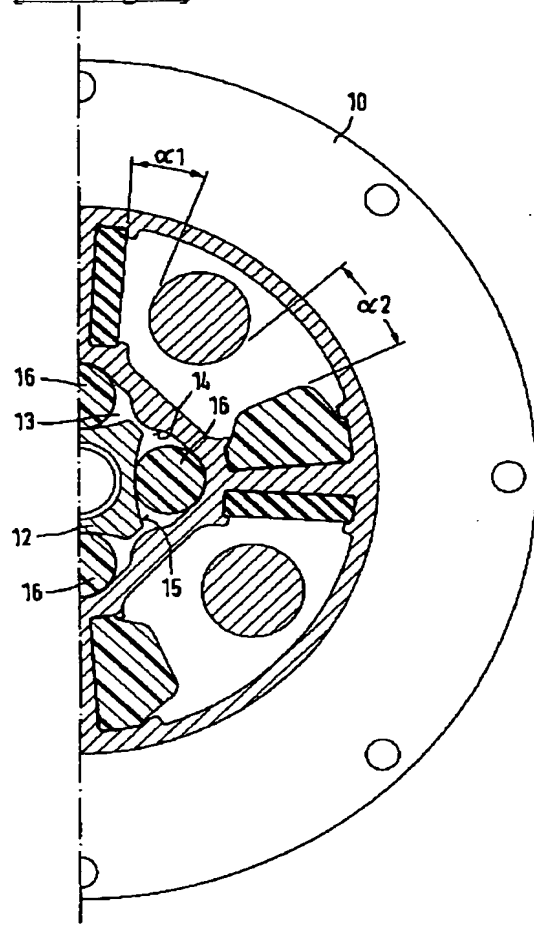
[Drawing 10]



[Drawing 11]



[Drawing 12]



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(72)Inventor : KIRSCHHEY GERHARD

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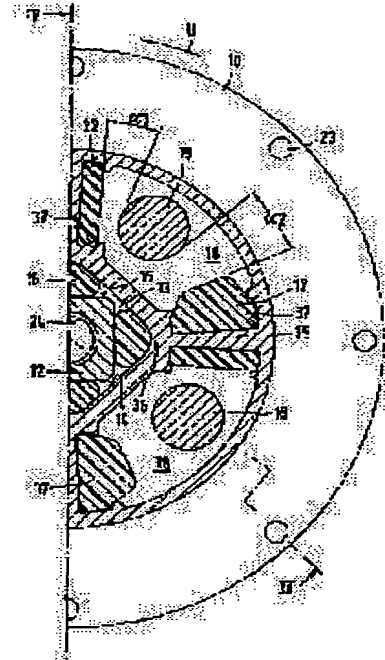
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(54) SHAFT COUPLING

(57)Abstract:

PURPOSE: To increase reliability in the operation by providing a first elastic shaft coupling of a known system of a rubber roller coupling having a bar-like rubber elastic coupling body supported between a hub and an external polygon to simplify the design of a two-stage torsion rubber elastic shaft coupling.

CONSTITUTION: Four elastic coupling bodies 16 form a first group to compensate a rubber ring of a prior art in the point of the function. When the torque is introduced to a coupling flange 10 useful for a drive flange in the circumferential direction U, the coupling flange 10 is relatively displaced to a hub 12 in the rotational direction, and a rubber elastic element 16 serves as a torsion bar. In a case of a small torque equivalent to the no-load operation or a low partial load of a prime mover, the torque is transmitted to the hub 12 through the rubber elastic element 16 and to a shaft coupled therewith only from the coupling flange 10. When the torque and the vibration amplitude are increased, a rubber elastic joint element 17 of a second group reaches a force bundle to transmit the power from the coupling flange 10 to the hub 12.



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(71) 出願人 592139371

ツエンターアントリーベ・キルシヤイ・ゲ
ゼルシャフト・ミット・ベシユレンクテ
ル・ハフツング

CENTA-ANTRIEBE KIRS
CHEY GESELLSCHAFT M
IT BESCHRANKTER HAF
TUNG

ドイツ連邦共和国ハーン/ラインラント・
ベルギシエ・シユトラーセ7

(72) 発明者 ゲールハルト・キルシヤイ

ドイツ連邦共和国ヴツベルタル・イツテ
ルターレル・シユトラーセ52

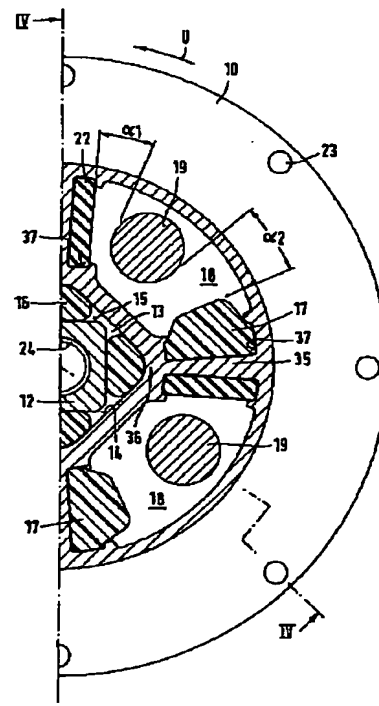
(74) 代理人 弁理士 中平 治

(54) 【発明の名称】 軸継手

(57) 【要約】 (修正有)

【構成】 動力伝達系列内の継手フランジから動力取出系列内のハブへとトルクを2段階で伝達するために、ねじり剛性を異にする2群のゴム弾性継手体を有するねじり弾性軸継手が設けられている。第1群のねじり軟性弾性継手体は、ハブの多角形外面と、それに適合した多角形の、しかし周面をずらして設けられた継手フランジ凹部との間で、半径方向元応力が加えられて挿入されている。この弾性第1継手段はきわめてねじり軟性である。ハブは耐ねじり性に二次動力伝達要素と結合されており、該要素は爪が軸線方向で継手フランジの周面溝孔内に嵌め込まれる。

【効果】 第2群のねじり剛性ゴム弾性継手体が設けられており、該継手体は、部分負荷が高くなつてはじめて、全負荷に至るまで、作動させられる。



【特許請求の範囲】

【請求項1】 特にボート原動機用の2段ねじり弾性軸継手であつて、実質的に、駆動側に設けるべき継手フランジと、軸線方向で継手フランジの中央凹部内に嵌め込まれる、被動側に設けるべきハブと、耐ねじり性にハブと結合された二次動力伝達要素とからなり、該要素が、継手フランジの周方向に延びた長手凹部内に軸線平行に進入する爪と2群の弾性継手要素とを備えており、少なくとも1つの弾性要素を有する第1群が継手フランジとハブとの間に設けられており、第2群が継手フランジの長手凹部に対して割り当てられており、該凹部に対して爪が周方向で周面移動可納に割り当てられており、第1群の弾性継手体が第2群よりも一段とねじり軟性に調整されており、低トルクのとき又は無負荷運転時又は低部分負荷のとき動力が継手フランジから専ら第1群の弾性継手体を介してハブに伝達され、部分負荷が大きくなつてはじめて、高トルクの全負荷に至るまで、ねじり剛性に調整された第2群の弾性継手体が自動的に動力伝達に割り込ませられるものにおいて、第1弾性継手段は、ハブと外部多角形との間で支承された棒状ゴム弾性継手体を有する公知のゴムローラ継手の方式で構成されており、更に、継手フランジは、爪を嵌め合わせるための長手凹部を中心に向かつて制限する壁部分が、同時に多部分多角形を形成しており、両群の弾性継手体は実質的に軸線方向でずれることなく互いに同心で設けられていることを特徴とする2段ねじり弾性軸継手。

【請求項2】 継手フランジ(10)の中央凹部(13)もハブ(12)も、それぞれ1つの多角形輪郭を有し、ハブ(12)と継手フランジ凹部(10)はそれらの輪郭が周面をずらして嵌め合わされており、周面のずれによつてハブ(12)と継手フランジ凹部(13)との間に形成された自由空間内に第1群の弾性継手体(16)が、好ましくは半径方向元応力を受けて、挿入されていることを特徴とする、請求項1に記載の継手。

【請求項3】 ハブ(12)及び継手フランジ凹部(13)の輪郭が正四角形によつて限定されていることを特徴とする、請求項1又は後続の1つに記載の継手。

【請求項4】 一方で継手フランジ凹部(10)、他方で長手凹部(18)が、それぞれ一比較的薄い一壁部分(35)によつて限定又は制限されており、それぞれ1つの多角形の隅(36)が、継手フランジ(10)の2つの長手凹部(18)を分離する壁部分(35)に対して半径方向に一列に並んで設けられていることを特徴とする、請求項1又は後続の1つに記載の継手。

【請求項5】 継手フランジ(10)の長手凹部(18)内に進入する爪(19)を有する二次動力伝達要素(20)が、実質的に平らな円板として構成されており、かつ耐ねじり性にハブ(12)と直接結合されていることを特徴とする、請求項1又は後続の1つに記載の継手。

【請求項6】 二次動力伝達要素(20)が、実質的にハブ(12)の多角形輪郭を有する中央受容凹部(21)を有し、かつコーキング又はリベット締めによつてハブ(12)と結合されていることを特徴とする、請求項5に記載の継手。

【請求項7】 第2群の弾性継手体(17)がスリーブとして構成されており、該スリーブが、ハブ(12)と結合された二次動力伝達要素(20)の爪(19)に嵌められており、かつ長手凹部(18)の横縁と協動することを特徴とする、請求項1又は後続の1つに記載の継手。

【請求項8】 第2群の弾性体(17; 22)が、バツド状成形品として構成されており、かつ長手凹部(18)の両横縁の範囲でポケット状受容部(37)内に差し込まれて保持されていることを特徴とする、請求項1に記載の継手。

【請求項9】 継手が未負荷状態のとき、爪(19)がそれぞれ弾性要素(17, 17; 17, 22)間のほぼ中央で静止位置を占めることを特徴とする、請求項8に記載の継手。

【請求項10】 駆動回転方向(U)を向いた第2群の継手体(17)がバツド状成形品として構成され、駆動回転方向(U)とは逆を向いた弾性継手体(22)が、実質的に、縦長長方形断面を有する板状に平らな止め体としてのみ構成されていることを特徴とする、請求項1に記載の継手。

【請求項11】 継手が未負荷状態のとき、爪(19)が、継手フランジ(10)の回転方向(U)とは逆を向いた長手凹部(18)の横縁の方、又は弾性継手体(17)の方にずれて静止位置を占めることを特徴とする、請求項8又は9に記載の継手。

【請求項12】 ハブ(12)が、軸(11)としつかり結合すべき本来のハブ体(12')と、第1弾性継手段の構成要素としてのスリーブ(12'')とに分割されており、ハブ体(12')が、スリーブ(12'')とで、耐ねじり性の、軸線方向に滑り可能な、滑り嵌め方式の嵌合いを形成することを特徴とする、請求項1又は後続の1つに記載の継手。

【請求項13】 スリーブ(12'')が、特にポリアミド、等のプラスチックからなることを特徴とする、請求項12に記載の継手。

【請求項14】 より高い質量慣性モーメントを有する回転質量を形成するために、二次動力伝達要素(20)が、所要の強度を超えて過寸法に設計されていることを特徴とする、請求項1又は後続の1つに記載の継手。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、請求項1の前提部分に記載された2段ねじり弾性軸継手に関する。

【0002】

【従来の技術】このような軸継手は、米国のメルクルーザ (MerCruiser) 社の広報刊行物により公知である。この軸継手は、特に原動機の無負荷運転時又は低部分負荷のときに発生する騒音（いわゆる“ギヤハンマリング”）を低減するために設計された。このような騒音は、特に、このような負荷条件によつて継手が十分なねじり軟性に設計されていないときに発生する。2段メルクルーザ軸継手では、比較的ねじり軟性に調整された弾性ゴムリング体を介して継手フランジがハブと結合されている。つまり、ボート原動機のはずみ車から継手フランジに伝達されるトルクはこのゴム弾性リングを介してハブに伝達され、該ハブに伝動軸が耐ねじり性に結合されている。無負荷運転時及び低い機関回転数のとき、弾性継手要素としてまずゴムリングのみが力束内に割り込ませられている。

【0003】更に、ハブは、継手配置の片側に設けられた皿要素又は円板状二次動力伝達要素としつかり結合されている。この動力伝達要素は、軸線方向に延びた6つのピンを担持しており、このピンに嵌められたゴム弾性スリーブは最初に挙げられたゴム弾性リング要素よりもねじり剛性である。スリーブ付きのピンは、継手フランジの内部で周面の各部分範囲を超えて延びた長手凹部に嵌め込まれる。駆動トルクが無負荷運転範囲内又は低部分負荷に留まる限りで、弾性スリーブ付きのピンは、この長手凹部内で、長手凹部の境界に衝突することなく、自由に発振することができる。駆動トルクが高まり、かつ継手部分相互の周面のずれが大きくなると、ゴム弾性リング単独の復元力がもはや十分ではなく、継手フランジとハブとの間で、従つてゴム弾性スリーブを備えたボルトと継手フランジの長手凹部との間でも、周方向でより大きな相対運動が現れる。より大きな角度行程に基づいて、いまやゴム弾性スリーブは長手凹部の、継手フランジの回転方向に向いた境界に達し、力又はトルク伝達機能を果たす。

【0004】このような2段ねじり弾性継手が示す減衰特性曲線は、無負荷運転時及び部分負荷範囲のとき、リングからなる弾性継手体のみが作用する場合、緩やかに上昇しており、ねじり剛性に調整された第2群の弾性継手体が投入されるや、この曲線は累進的に上昇する枝線に移行する。

【0005】2段設計の基本原理解の方から、この公知の継手は、ねじり軟性の第1減衰段を用意することにより、無負荷運転時又は部分負荷運転時に発生する騒音をかなり下げる目的を達成するのに好適である。公知の継手の欠点は、構造が複雑で真に支出高である点にある。つまり、明らかに、ゴムリングは一方で継手フランジと、他方でハブとねじ止めされている。他方で、弾性リング体は、継手部分とねじ止めされることができるよう、ねじ止めフランジを備えていなければならない。こ

のことから、製造及び組立が支出高となり又それに応じてコスト高となる。

【0006】

【発明が解決しようとする課題】そこで、本発明の課題は、請求項1の前提部分で前提とされた種類の2段ねじり弾性軸継手を設計上かなり簡素化することである。更に、動作信頼性を高めることに重きが置かれる。

【0007】

【課題を解決するための手段】本発明は、この課題を、まず第一に、実質的に、請求項1の特徴部分に明示された特徴によつて解決する。

【0008】こうして、構造全体が単純な継手を得られ、この継手は一加硫された弾性継手体なしでも間に合うので動作信頼性もきわめて高い。ゴムローラ継手自体は確かに公知である。しかし本発明は、これを最適な仕方では第2継手段内に一体化することによつて、特に適切な仕方ではこの継手を利用する。この一体化は、両段の半径方向割当てにも軸線方向割当てにも関係している。つまり最初に述べられた先行技術ではゴムリングを少なくとも部分的に軸線方向で継手フランジの前に設けておかなければならないのに対して、いまや両段は、軸線方向のずれを有するのではなく、むしろ一方の段が他方の段で覆われているように一体化することができる。このことから、有利な仕方では、軸線方向できわめて狭く構成される継手ユニットも提供される。

【0009】本発明によるねじり弾性軸継手では、ほとんど専ら、ゴム部品と金属部品とが接触し、金属部品が相互に接触するのではない。こうして、相接触する金属部品間で、力が変化するときには危くされるフレッチング腐食は防止される。この継手は耐摩耗性にきわめて優れており、保守不要である。

【0010】ハブ及び継手フランジ凹部の輪郭は、好ましくは、正四角形によつて限定されている。一方で継手フランジ凹部、他方で長手凹部が、それぞれ一比較的薄い壁部分によつて限定又は制限されており、それぞれ1つの多角形の隅が、継手フランジの2つの長手凹部を分離する壁部分に対して半径方向に一列に並んで設けられているとき、特に適切な1構成が得られる。これにより、継手、特に継手フランジの軽量骨格構造が、一貫してほぼ一定に設計可能な壁厚で達成され、これにより、形状の複雑な継手フランジは金属又はプラスチック、特にガラス繊維強化プラスチックから、注型品として製造されるのが特に望ましい。

【0011】本発明対象のその他の有利な特徴及び望ましいその他の構成は、残りの従属請求項に明示されており、添付図面に基づいていくつかの実施例についての以下の説明から明らかとなる。

【0012】

【実施例】継手は、それぞれ、まず、駆動側に割り当てられた継手フランジ10と、被動側で、例えば伝動装置

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の軸11と結合すべきハブとを含む。継手フランジ10は、多角形輪郭14を有する中央凹部13を有する。ハブ12は同様に適当な多角形輪郭15を有し、しかし辺の長さが短く、従つて直径が小さい。

【0013】ハブ12の外輪郭15と継手フランジ凹部13の内輪郭14との間に、それもしか、ハブ12と継手フランジ凹部13が、図示された四角形の場合正確に45°だけ、相互に周面をずらして設けられているときに生じる自由空間内に、棒状又は円筒状ゴム弾性体16が挿入されている。ゴム弾性体13は、かなりの半径方向元応力を受けて、ハブ12の外周15の前で、継手フランジ凹部13内に取り付けられている。この取付けは工場側で特別な装置を利用して行われる。その後、この構成は、実際の運転時、分解不可能である。

【0014】本実施例の場合4つの弾性継手体16が第1群を形成し、機能の点で、最初に述べられた先行技術のゴムリングを補う。駆動フランジとして役立つ継手フランジ10に対してトルクが周方向Uで導入されると、継手フランジ10はこの回転方向でハブ12に対して相対的に変位し、その際、ゴム弾性要素16がトーションバーとして働く。この状態が図2に示されており、この図には、図示簡略の理由から、ハブに対する継手フランジの周面のずれではなく、その逆回転が図示されている。原動機の無負荷運転又は低部分負荷に相当する小さなトルクの場合、継手フランジ10のみからゴム弾性要素16を介してハブ12に、及びこれと結合された軸11に、トルクの伝達が行われる。こうして、ねじり軟性ゴム要素16を有するこの第1継手段は、一定程度に至るまでねじり振動を単独で減衰することができる。

【0015】トルク及び振動振幅が大きくなると、第2群のゴム弾性継手要素17が力束内に達する。このゴム弾性体17は、それぞれ、周面凹部18の周面回転方向Uとは逆側にある末端に取り付けられており、該凹部は中央継手フランジ凹部の外側に、これを取り囲む形で、継手フランジに設けられている。爪19は円板状二次動力伝達要素20に一端がしっかりと固定されており、軸線方向で周面凹部18内に嵌め込まれ、この爪の突接を減衰する前記ゴム弾性継手体17を介して、継手フランジ10からハブ12へと動力伝達が行われる。二次動力伝達要素20はやはり耐ねじりにハブ12と結合されている(例えば図4参照)。爪19と動力伝達要素20との結合も、該要素とハブ12との結合も、それぞれ、リベット締め又はコーキングによつて、形状結合式に行われる。このことも図4から、そして図6及び図8からも、明らかとなる。ハブ12が円とは異なる周面を有するので、ここでは特別な形状結合措置を講じる必要がない。適当な多角形開口21が動力伝達要素20に設けられれば十分である。

【0016】継手フランジ10とハブ12が無負荷運転時又は下側部分負荷範囲のとき周方向で相互に発振する

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限り、一上に述べられたように第1群のゴム弾性要素16のみが振動減衰作用を行う。しかし、この発振が、回転数及びトルクが上昇して大きな振幅に達すると、継手部分10、12相互の周面のずれが増すのに伴つて爪19は第2群のゴム弾性要素17の方向に移動し、第2群も力束内に割り込ませられており、いまやトルクをねじり弾性的に駆動軸に伝達することができる。この状態が図2に示されている。

【0017】第1継手段のねじり弾性能力をできるだけ十分に利用できるようにするために、周方向で測定された自由空間、つまり、爪19が付属の第2群の弾性継手要素17に突接することができるまでの自由行程 $\alpha 2$ は、周面角度 $\alpha 1$ とされた当該後部自由空間よりも大きい。後部に認めることのできる、板状に平らな弾性ゴム要素22は、実質的に、負のトルクが現れたときに金属接触を防止しつつ爪19の突接を減衰することがその役目であるので、基本的に、パッド状ゴム弾性体17とは別の機能を有する。負のトルクは、特に過渡運転時の共振通過のときに現れることがある。

【0018】説明された2段ねじり弾性軸継手は、明らかなように、単純な構造を有し、金属対金属接触及びそれに伴つて更に現れることのあるフレッチング腐食を防止し、ボルト固定手段を利用することなく工場側で取り付けられることができる。弾性継手体17、22は、軸線方向で受容ポケット37内に単純に差し込まれて、そのなかで摩擦結合及び形状結合によつて保持されている。

【0019】この継手はねじり弾性挙動が優れている。弾性継手体16を介した第1段は、僅かな累進的特性曲線を有する高ねじり弾性である。第2段は、強累進性を有し、こうして、より高い部分負荷間の範囲から全負荷に至るまでで伝達するのに最も適している。この設計は、実質的に、継手の定格トルクを基準に、第1段が約10%、第2段が約90%、動力伝達及び減衰に関与しているようになされている。

【0020】図3の実施は、実質的に、爪19がこの場合、円筒ボルトではなく、ほぼ長方形断面を有する比較的平らなスタッドである点で、図1及び図2に基づいて説明された実施と相違している。そのことから、機能的相違点として、図1の継手では、爪19とゴム弾性体17との接触がほぼ全面で行われる図3の継手の場合よりもより柔らかく減衰が始まることになる。更に、継手が未負荷静止位置のときに爪19が周面の中央で長手凹部18内に位置するように構成がなされており、この場合同一に構成された弾性継手体17に突接するに至るまで、回転方向Uにおける又はその逆方向における角度行程は同一である。このように完全に対称な継手は、特に、回転方向が交互する用途に適している。

【0021】図5及び図6に示された第3実施態様では、第2群のゴム弾性継手体17が、長手凹部18に対

して直接割り当てられているのではなく、爪19に対して割り当てられており、それに押し付けられるスリーブ体として構成されている。周方向における予備配向は、この場合、図1と対比し得る仕方となされている。周面角度比 $\alpha 2 / \alpha 1$ を見よ。この実施態様の利点は、一方で弾性体17の構成、他方で単純に限定されたほぼ腎臓形の長手凹部18の構成が簡素であることにある。

【0022】以上に述べられた型式の継手は、軸線方向で、当該駆動集成装置に装着されることができる。継手フランジ10が、例えばはずみ車等の機械部分に、図示しないねじを周面穴23に通して結合される一方、ハブ12は、適当に形成された軸11に対して軸線方向で嵌まるために、内側をインボリュート・スプライン断面24として構成されている。

【0023】それに対して、図7及び図8に図示され、その他の点では図1及び図4の実施例に一致した設計の実施態様では、継手の軸線方向差込み性は、ゴム筒26及びねじ27でははずみ車のフランジ28にねじ止めされたスリーブ29をそれぞれ含む弾性かみ合い継手25を利用して実現されている。ゴム筒26は、実質的に、許容差補償機能を有し、金属対金属接触を防止し、継手フランジ穴30に差し込まれて直接受容するのに役立つ。

【0024】ハブ12の受容穴31はこの場合円錐形に構成されており、それに合わせて軸12の末端がテーパ32を有する。この場合、結合及び固定に役立つのはくさび33と正面ねじ止め部34である。この構成の利点は、軸11に対するハブ12の固定を迅速簡単に実行することができかつ十分に確実にすることができることにある。

【0025】図9～図11に示された継手は、そのハブ12が、軸11と結合すべき本来のハブ体12'とスリーブ12''とに分割されている。このスリーブ12''は第1継手段の構成要素であり、ゴム弾性継手体16がそれに取り付けられている。スリーブ12''とハブ12'は、滑り嵌めで互いに耐ねじり性に差込み結合できるように、互いに合致されている。突接制限のためにハブ体12'及びスリーブ12''はそれぞれ正面カラー12'a、12''aを備えている。軸線方向差込み結合の過程で、組立は、この場合図11を参考に次のように行われる。即ち、爪19を有する二次動力伝達要素20がハブ体12'に固定されており、まずこのハブ体が伝動軸11の末端にくさび止めされ、残りの継手構成(図11の左半分)は、継手フランジ10を機関はずみ車にねじ止めすることにより、機関側に取り付けられる。次に、伝動装置は軸線方向で機関の方に、又その際ハブ体12'がスリーブ12''内に、押しやられる。

【0026】“多角形輪郭”に言及されている限りで、これは、例えば、厳密な“長方形”を排他的に意味してはいない。例えば、図12でハブ12の外周面に、又継

手フランジ凹部13の内周面に示されたような種類の造形も、本発明の意味における多角形構成である。ハブ12と継手フランジ凹部との間で、変形可能ではあるがしかし“転り出る”ことができないような場所でゴム弾性体16が保持されていることが大切である。それ故に、ゴム弾性体は継手フランジ凹部の隅範囲内に位置決めされてハブ側の面15と接触させられるのが好ましい。この面15は、全く、平らである必要はない。それは、例えば、図12の図示に対応してゴム弾性体16に向かって凹面形成しておくこともできる。そのことから、ちなみに、より急峻なばね特性曲線(弾性減衰の累進性向上)が帰結する。図12では、ゴム弾性継手体16が静止位置のときごく僅かな半径方向元応力を受けているだけであることが示されている。つまりこの場合減衰特性は、最初、ねじり軟性であり、次に、急激にねじり剛性となる。

【0027】最後に、板状の二次動力伝達要素は、意識的に過寸法に設計されており、特に、必要以上に大きな直径を備えていることを指摘しておく。二次側質量慣性モーメントがこのように増加する結果、継手系の共振は、より低い回転数の方にずらされることができる。

【0028】最後になお強調しなければならないのは、いずれの実施でも継手フランジ10が骨格状に構成されており、凹部13、18及びそれを限定し又は相互に隣接した壁が適切に設けられかつ割り当てられている点である。これは、実質的に、ハブ12及び継手フランジ凹部13の多角形側面の数に一致した数の周面凹部18が設けられており、周面凹部18を仕切る仕切壁35が多角形の隅36に対して半径方向で1列に並んで設けられていることによつて達成される。これにより、すべての材料断面は、好ましいことに、近似的に同じ寸法で設計することができる。

【図面の簡単な説明】

【図1】第1実施態様による軸継手の無負荷状態における半径方向半断面図である。

【図2】トルクで負荷された、同じ継手の図示である。

【図3】図1及び図2の実施に比べて僅かに変更された実施態様を示す。

【図4】図1～図3のIV-IV断面に相当する半径方向断面図である。

【図5】選択的継手構造の横断面図である。

【図6】選択的継手構造の縦断面図である。

【図7】別の構成の横断面図である。

【図8】別の構成の縦断面図である。

【図9】2分割されたハブを有する配置の半横断面図である。

【図10】図9の縦断面図である。

【図11】分解状態における、図9に相当する断面図である。

【図12】ハブ及び継手フランジ凹部の多角形構成に関

する形状変種を示す。

【符号の説明】

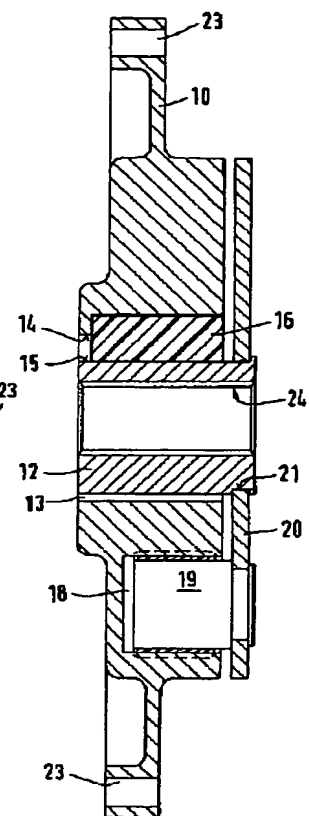
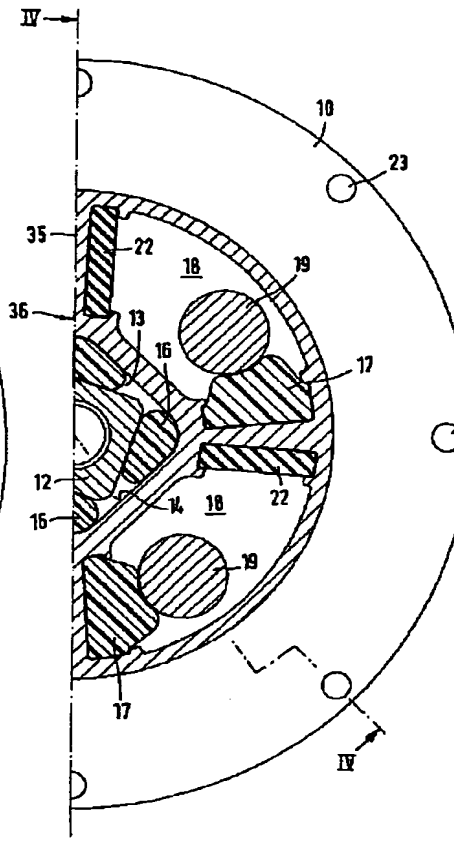
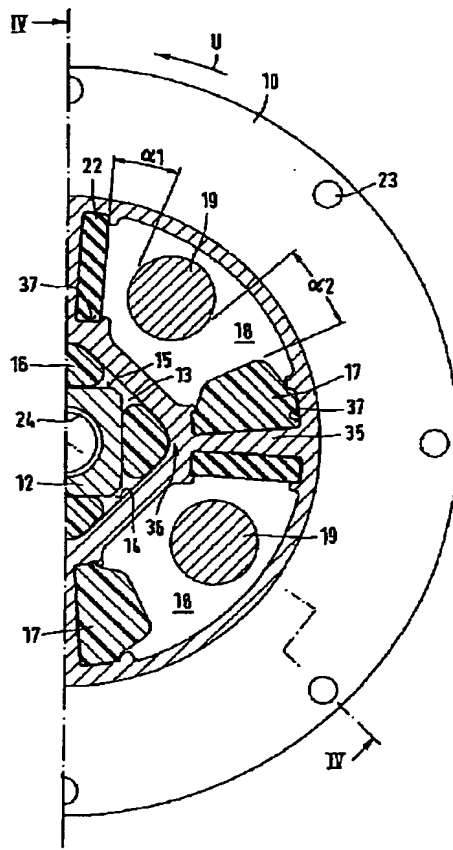
- 10 継手フランジ
11 軸
12 ハブ
12' ハブ体
12'' スリーブ
13 継手フランジ凹部

- 14 内輪郭
15 多角形輪郭
16 弾性継手体
17 ゴム弾性継手要素
18 周面凹部
19 爪
20 二次動力伝達要素

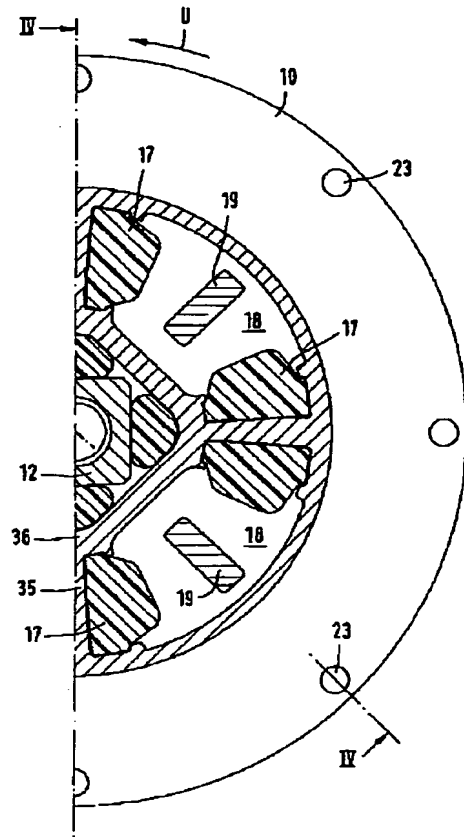
【図1】

【図2】

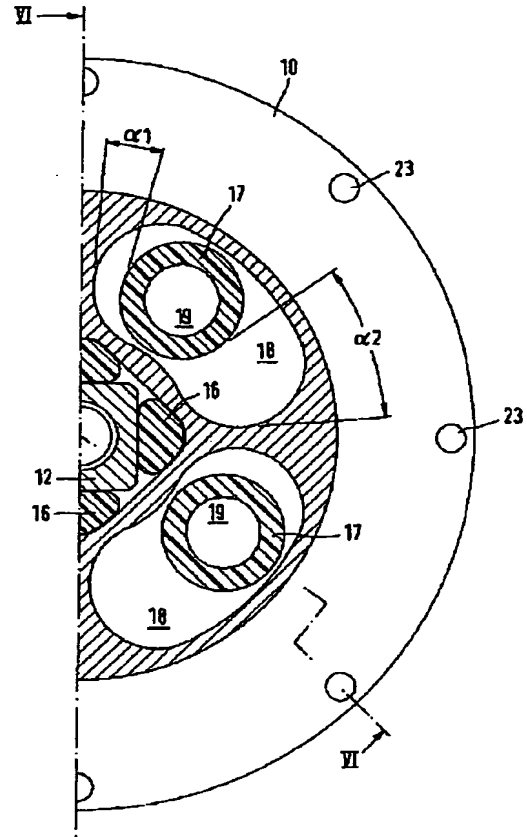
【図4】



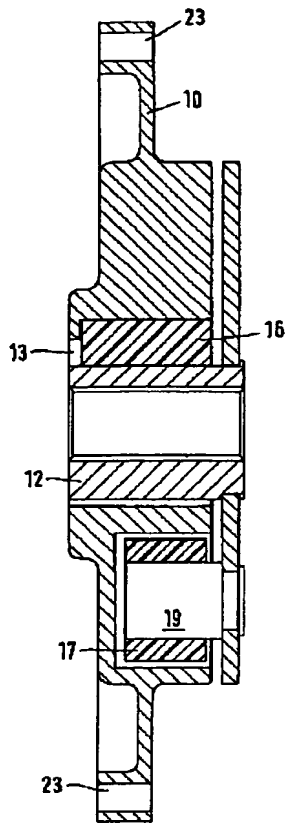
【図3】



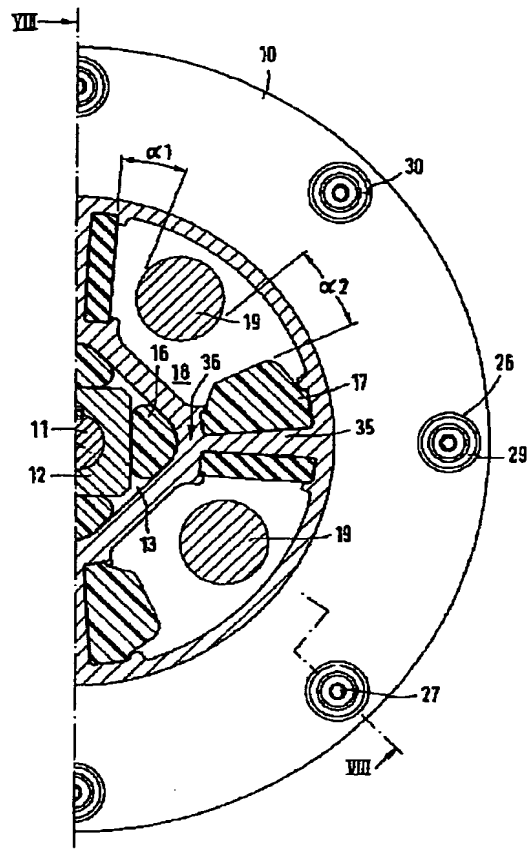
【図5】



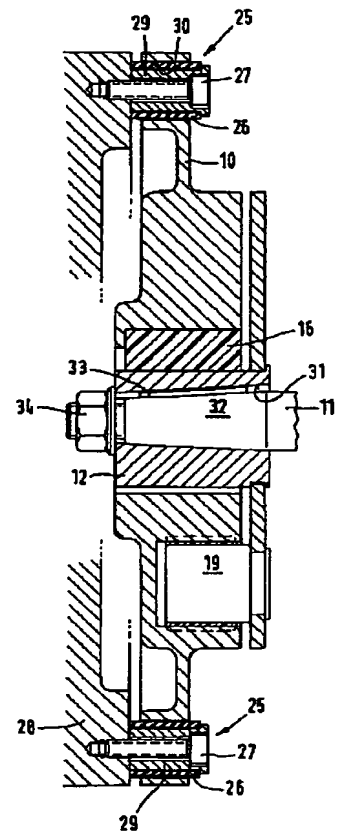
【図6】



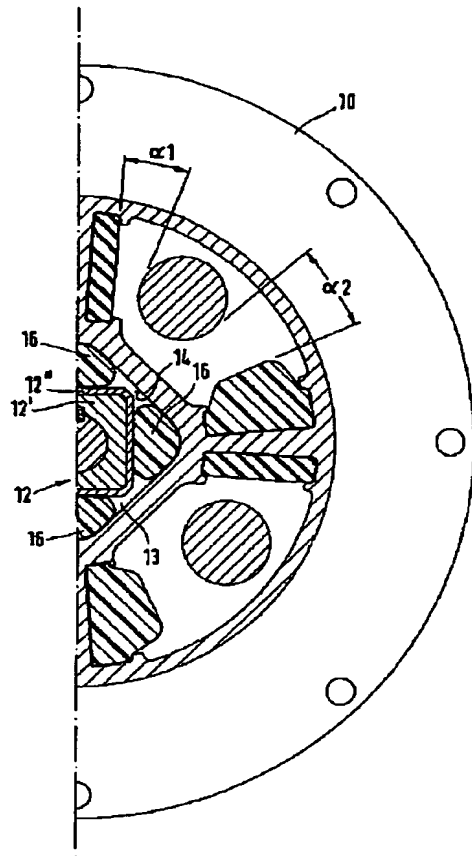
【図7】



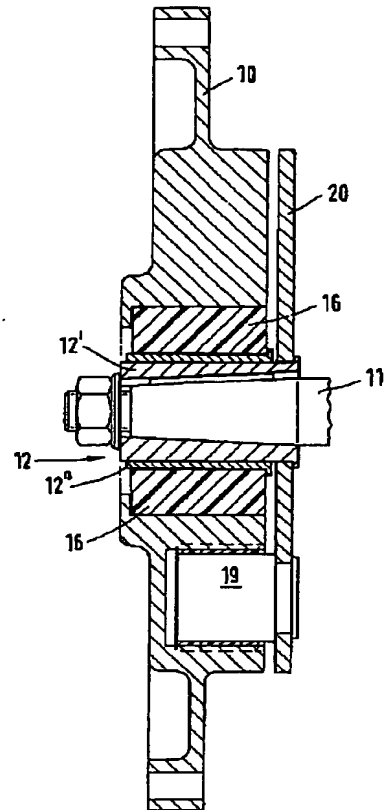
【図8】



【図9】



【図10】



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